Total factor productivity in Australian domestic aviation

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Abstract

This paper develops measures of total factor productivity for Australian domestic air transport over the past two decades, and enables comparisons to be made with the productivity of international airlines. In recent years there has been little by way of measurement of productivity performance of the Australian domestic airlines. A major reason for this has been the poor availability of data—data typically available for international airlines are no longer available for the Australian domestic airlines. Strictly speaking, it is no longer possible to measure total factor productivity for the domestic airlines, as critical data are missing. It is possible, however, to fill in the gaps with proxies, which enable useful, albeit imperfect, productivity measures to be developed. These can also be compared to published measures for international airlines. The results enable an assessment of the productivity performance of Australian domestic airlines over the past two decades (and especially over the post deregulation period). They also enable an assessment of the extent to which productivity has caught up with that achieved in well performing airlines overseas. The results also show light on whether there is scope for new airlines, such as the proposed entrant Virgin, to achieve lower costs than the incumbents.

1. Introduction

In this paper, estimates are made of changes in total factor productivity in Australian domestic aviation over the past two decades. Further, comparisons of productivity are made between the domestic airlines in Australia and a sample of international airlines, some of which are primarily domestic or short haul. This enables an evaluation of the effects of domestic deregulation which took place in 1990. Any effects of deregulation should be evident by now.

In spite of policy changes such as deregulation, there has been little by way of productivity measurement for Australian airlines since the mid 1980s. In the late 1970s and early 1980s, there was considerable interest in productivity measurement, and in developing comparisons with overseas airlines. The Australian domestic airlines performed relatively poorly compared with the US domestic airlines, and this was a factor which strengthened the case for deregulation. It was expected that a competitive environment, coupled with an absence of cost plus regulation, would lead to significantly improved productivity performance.

This lack of interest in performance measurement is partly explained by the lack of data. With deregulation came a reduction in data sources; the same data which were needed to evaluate deregulation became unavailable because of it. In this paper, it will be necessary to rely on some distinctly second best proxies in order to develop comprehensive productivity measures. There is, however, some poorly informed debate about the industry's performance.

The initial period following deregulation corresponded with a period of intensive competition, and substantial reductions in fares. This period was short lived, and the industry reverted to one with two dominant incumbent airlines. Fares have increased since the end of the competitive period, though the airlines have not been especially profitable. This suggests that the productivity performance has not been particularly good. Currently it is being suggested by several that deregulation has not been a success. Some evaluation of productivity performance is thus overdue.

The competitive situation in the industry is beginning to change again. In June 2000 a new airline, Impulse Airlines, entered domestic markets. It served a limited range of dense markets around Sydney on a low cost, no frills basis. However, recently it has been taken over by Qantas. Of possibly greater impact is the entry by Virgin Blue Airlines, a subsidiary of the well established Virgin group. This airline also offers a no frills, low fares service, like its related airlines elsewhere. The success of these entrants will depend partly on whether they are able to achieve significantly lower costs than the incumbent airlines, for a period long enough to enable them to get established. If the productivity of the incumbents is not very high, this may well be so. Productivity measures thus can provide some pointers as to the likely success of these new entrants.

The paper begins with a background on the Australian domestic industry, and in particular, earlier productivity studies are discussed. In the following section, the methodology to be employed is described, along with the sources of data. Since the data sources are poor and incomplete, much depends on the choice of proxies and approximations made. In the fourth section, the results, for a two decade time series, and a cross country comparison, are presented and discussed. Finally, the implications of these results for the impending period of more intense competition are discussed briefly.

2. Background: regulation, productive efficiency and deregulation

When Australia deregulated its domestic airlines, there was the expectation that this would lead to markedly improved performance. While there were expected to be gains through increased allocative efficiency (for example, with more demand responsive price structures) the bulk of the gains were expected to come from increased productive efficiency. A number of studies in the 1970s and 1980s had indicated that, compared to overseas airlines, and North American airlines in particular, the Australian domestic airlines were not very productively efficient.

The poor performance of the pre deregulation period was not surprising given the nature of the regulation in place. A very rigid form of regulation, called the two airline policy, was in place from about 1960 onwards. This policy meant that only two airlines, Ansett and Trans Australia Airlines, were allowed to serve trunk markets. These airlines in turn were regulated to be virtually identical, with identical fleets and capacity, and nearly identical route networks. For a time, these airlines were required, by law, to consult each other on price setting; prices were identical. Thus the scope for competition between the airlines was tightly constrained, and there was no possibility of competition from other airlines. The airlines were not forced by competition to be productively efficient.

The airlines did not have strong incentives to minimise costs. One of the airlines was government owned, while the other, Ansett, was privately owned. However, these airlines were subjected to what amounted to rate of return regulation. This was informal at first, but by the 1980s it had been formalised by a regulatory body which adopted rate of return regulation. As is well known from US regulatory experience, this form of regulation significantly weakens any incentives to minimise costs. For many years until the early 1980s, both airlines managed to achieve very consistent profitability. For a period in the 1980s however they were unprofitable; this happened when the economy went into a moderately severe recession.

In the late 1970s, the performance of the airlines began to attract attention. Comparisons were made with the US domestic airlines, which were found to be significantly more productively efficient. A number of studies reinforced this conclusion. The first of these was that by [MacKay (1979)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB6), who noted that unit costs of the Australian domestic airlines were about 20% higher than those of the US airlines, even after allowing for factors such as stage lengths, aircraft size, wages and fuel prices. [Forsyth and Hocking (1980)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB4)noted large differences in labour productivity between the Australian and US domestics. [Kirby (1984)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB5) estimated a translog cost function, including Australian and US domestic airlines, over a period of years covering the 1970s and 1980s; he concluded that costs in the Australian airlines could be lowered some 35%. The [Bureau of Transport Economics (1985)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB2) also noted big differences in partial productivity ratios in the early 1980s between the two groups of airlines. A review of airline regulation ([May, 1985](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB7)) compared air fares between comparable city pairs, and concluded that Australian fares were higher.

By the mid 1980s it was well established that the Australian airlines were operating at higher costs than the US airlines (especially in comparison with the new low cost airlines which were then emerging). Some of this difference might be explained by different operating environments. The Australian market was much smaller than the US market, though the main trunk routes had comparable densities. It was further away from aircraft manufacturers, and the airlines were unable to contract out as many services as the US airlines. As against this, the flying weather was very good, and airports were almost never congested. The standard of service was high on the Australian airlines.

This experience led to high expectations for deregulation. With airlines less constrained by rate of return regulation and more oriented to profit, there would be a greater incentive to keep costs down. With more airlines likely to enter the market, the two major airlines would be subjected to pressure to lower costs. It was not expected that there would be a large number of airlines operating throughout the market, but it was expected that there would be a few, some specialising in niche markets, and this would be sufficient to provide a strong spur to improved performance.

The initial post deregulation period seemed to confirm these expectations. A new low cost airline, Compass, entered, cut air fares substantially, and captured a significant proportion of the market (12% overall and 25% of the markets it served). The incumbents matched the fare reductions. Overall the industry was unprofitable, since deregulation coincided with a recession. After about a year of operations, Compass collapsed. There was a brief presence in the market of another low cost airline, but after this also collapsed, there has been no further entrants, and the two airlines have had the market to themselves. It was not until 2000 that two new airlines, Impulse and Virgin, sought to enter the Australian domestic market.

The early 1990s also saw other changes. The government owned domestic airline, by then called Australian Airlines, was taken over by Qantas, and the merged airline was subsequently privatised. Air fares, which had fallen during the period of Compass entry, gradually rose again. In spite of this, the increases in air travel, which were spectacular, were not fully eroded. By 1996, real air fares had fallen somewhat since deregulation, and the profitability of the airlines had almost recovered.

When it operated, Compass was able to achieve much lower unit costs than the incumbent airlines ([Nyathi et al., 1993](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142" \l "BIB8)). This was partly explained by its longer stage lengths and larger average aircraft size. Another factor was that Compass was a no frills airline, offering lower service standards than the incumbents. However, even after allowing for these factors, its costs were significantly lower, indicating that lower cost operation in Australia was feasible.

By the end of the 1990s, price competition between the incumbent airlines was not strong, and both were moderately profitable (no data for Qantas’ domestic operations are published any more, however). Price structures had become more flexible, with a greater range of discount fares available. Over the post deregulation period, it seemed that there had been only modest productivity gains. This would lead one to believe that the productivity gap between the Australian and US domestic airlines has not been narrowed by very much, even taking into account the fact that US airlines have recently only recorded only modest productivity gains.

3. Methodology and data

Two types of productivity comparison are made: one involves productivity within the Australian system over time, and the second comparison involves comparing the productivity in Australia with that of airlines elsewhere in the world (with particular emphasis on the US). Productivity is measured within Australia for various years from 1982 to 1999, and the cross country comparison is made for 1993.

For the time series, productivity is measured for the years 1982, 1985, 1988, 1993, 1996 and 1999. This gives a series of observations before and after 1990, the year of deregulation. It also avoids measurements taken during the pilots strike of 1989–90, which makes data for the years around 1990 rather suspect. The choice of these dates is partly determined by data availability. Information is collected about costs and revenues, along with input prices and quantities. Thus it is possible to determine who gained from the productivity improvements over the period.

The data used were for a composite of domestic airlines, Ansett and Australian/Qantas. Basically the output, cost, revenue and input quantity data are from Ansett, while some of the input price data are for Australian/Qantas. The assumption is made that the airlines face similar input prices; in earlier years, when data were available for both, this was so. This was done because of a lack of input price data for Ansett. The result is hopefully a set of measures for a typical composite airline. It is not possible to measure productivity using published data for either of the airlines over the whole of the period. In the later years, Qantas has not been publishing data about its domestic operations, which are integrated into its overall operations. In the earlier years, Ansett did not publish much information at all about its operations, and such financial information it published also covered other operations, such as road freight and hotels. More recently, Ansett has been primarily an airline. Ansett recently has operated internationally; an attempt has been made to exclude international operations from the data used.

The international cross country measures were done by linking into another published study of the productivity of international airlines, namely that by [Oum and Yu (1995)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142" \l "BIB9). This was done partly to avoid the necessity for an extensive data collection exercise. The Oum and Yu study is an appropriate one to link into, since it is explicit about its methods, and its data, and thus the data are relatively easy to match up with. The comparison is made for 1993.

The technique used is that suggested by [Caves et al. (1982)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB3). This involves calculating a multilateral version of the Tornqvist index. For the time series study, only the basic index numbers are given, since output characteristics (e.g. stage lengths) did not change much over the period. For the international comparison, it was necessary to adjust the basic productivity measures to take account of the very different output characteristics; this was done using the approach used by [Oum and Yu (1995)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142" \l "BIB9).

Information was collected about outputs, revenues and overall costs, along with input prices and quantities. Since measured productivity depends on output and operating characteristics, these were collected—these are particularly important in the cross country comparisons.

Revenue estimates were taken from Ansett annual reports, cross checked with information published in [Bureau, 1993](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB1) and [Bureau, 1985](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB2). Revenue from international operations was deducted from the total to obtain a measure of domestic revenue. Inputs were scaled down proportionately. Costs were more difficult to estimate, given that it was necessary to take account of all capital costs, including a return on equity. Earnings before Interest and Depreciation were deducted from revenues, and estimated capital costs were added back in. This also provided a measure of economic profit.

Two output measures were used. One was revenue passenger kilometres. This measure is an incomplete one of the airline's total output, as it leaves out freight mail and ancillary revenues. Information about these is difficult to come by, but for those years for which data are available (sometimes for the domestic industry as a whole) it does not appear that there has been much of a shift in the proportions of the different output components. Thus, revenue passenger kilometres is a good proxy.

A second output measure was obtained by dividing revenues by a price index. The fare index was obtained from data on fares published by the Bureau of Transport and Communications Economics in its Transport Indicators series. For the earlier years, it mainly collected data on economy fares; while these do not show the whole story, for the pre deregulation period, discount fares were not so freely available, and they probably tracked economy fares. Where possible, the BTCE fares for medium distance routes were used; this would give a price index for a reasonably consistent output type. For the later years, an average of economy, discount and business class fares was used. Since patterns in these fares do diverge in the 1990s, it is important to allow for all types in developing the index. The index used, however, probably does not capture the full effects of the switch to discount fares in the post deregulation period.

Outputs as measured by the different approaches do differ quite considerably. The RPK measure grows much more rapidly than the revenue deflated by the fare index. This is not unexpected; the fare index attempts to present a measure for an unchanged output, whereas RPK will be affected by changes in output characteristics, such as stage length and shifts in the output mix (e.g. from full to economy fares—not all RPKs are identical). Using these two measures will enable upper and lower bounds to productivity growth to be determined.

Employment figures are available for Ansett for some, though not all years under consideration. Published employment numbers for the 1980s average around 10,000 but for the 1990s average 15,000—the sharp increase around 1990 raises questions about the comparability of the measures. The increase can be partly explained by a merger with another airline, and by the increase in output. Average wages for Ansett are not available, so a series of average wages for Qantas was used; the two airlines would pay similar, though not identical wages.

Information about fuel prices was obtained from industry sources and from a series published by the BTCE in its Transport Indicators series. There is no published information about fuel expenditure or fuel use by the domestic airlines. To make an estimate, it was assumed that the ratio of fuel use to RPK for Ansett would be the same as for international airlines with similar stage lengths USAir, Lufthansa and All Nippon, as reported by [Oum and Yu (1995)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142" \l "BIB9). The estimate for fuel use for 1993 was projected backwards and forwards assuming a 2.5% improvement in fuel efficiency per RPK over the period (a similar improvement in fuel efficiency was estimated to have taken place in Qantas over the 1980s see [Industry Commission, 1990](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB11)). The result is what seems to be a high fuel expense. To the extent that fuel expense is overestimated, expenditure on other materials will be underestimated.

Capital expenditure was estimated in two stages. The ratio of capital expense, on equipment for Qantas in 1993, as estimated by [Oum and Yu (1995)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142" \l "BIB9) was taken and it was assumed that the ratio would be the same for Ansett. This ratio was slightly less than 8%. A ratio of 8% was applied to total assets to estimate capital expense for the years before and after 1993. The capital expense was deflated by the Capital Equipment Deflator in the GDP statistics to obtain a series of quantity of capital services. This measure will exclude any allowance for the cost of leased equipment, which will be recorded in the other materials category.

Expenditure on other materials was estimated by subtracting capital, labour and fuel expense from total costs. The quantity of services was estimated by deflating by the GDP deflator. This category, which is a residual, does tend to vary somewhat, reflecting its dependence on the accuracy of estimates of other components. Any errors will be offsetting, since a high estimate of labour cost leads to a low estimate of the other materials expense, and the impact on measured productivity will tend to be small. For the international comparisons, purchasing power parity data on prices of output in Australia and the US from the World Bank, World Development Reports, was used.

Finally, information on output characteristics, such as stage length and load factors was obtained from annual reports.

4. Results

Total factor productivity measures for the period 1982–1999 are shown in [Table 2](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL2). Two measures are presented corresponding to the two price and output measures. The first of these, Output A, is based on the observed revenue passenger kilometres. The second is based on deflating revenue by a price index. The first thing to note is that the two indices tell very different stories. The first index shows a considerable improvement in TFP, especially since 1988. The second shows no improvement over the whole period, though there is a tailing off in the post deregulation period.

Of the two, the former probably gives a more accurate picture. As is implicit from [Table 1](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL1), the number of passenger journeys grew almost as rapidly as RPKs, and the average price paid for a journey fell considerably. This can be explained by a strong shift, especially since 1990, towards the discount fare categories. The characteristics of the passenger journeys did not change much—load factors and stage lengths did not alter much over the period. Hence the lower revenue yield cannot be explained by longer stage lengths, for example.

Table 1.

Output characteristics: 1982–1999 typical Australian domestic airline (Source: Ansett Airlines, Annual Reports)

| Year | Revenue passenger kilometres (m) | Stage length (km) | Load factor % |
| --- | --- | --- | --- |
| 1981/82 | 4495 | 942 | 69.9 |
| 1984/85 | 4728 | 987 | 73.9 |
| 1987/88 | 6168 | 1009 | 76.5 |
| 1992/93 | 10580 | 1001 | 74.0 |
| 1995/96 | 14541 | 1272 | 69.4 |
| 1998/99 | 14920 | 1266 | 71.7 |

[Table options](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142)

Productivity measure A does overestimate productivity change to the extent that the average quality of the output has fallen, assuming that discount fares, with more restrictions and less convenience, represent a lower quality of service. While the air fare index has increased faster than inflation during the period, and especially the post 1988 period, this probably indicates that this index is not representative of the average of air fares. It is highly dependent on the economy fare, and in the post deregulation period, the airlines have been more sophisticated in their use of yield management, and have targeted the less elastic customers for higher fares, while reducing fares in the discount categories. Since 1990 there has been a very large increase in passenger trips, even though economic growth has, for the period as a whole, not been spectacular. This is consistent with passengers facing fares which are, in a real sense, lower.

[Table 2](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL2) and [Table 3](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL3)suggest that productivity growth has been quite rapid since deregulation. In [Table 3](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL3), a real price index is calculated by deflating the output price index by the input price index. This will be, approximately, the mirror image of the TFP index (but, see below). The 1980s seem to have been a period of modest if any change in productivity. There was a significant shift in the 1988–1993 period, which was the period when deregulation was fully anticipated, and the incumbent airlines were reducing their costs in readiness for it, and it also covers the brief competitive period in 1991 and 1992.

Table 2.

Output and productivity: 1982–1999 (Output A: Revenue passenger kilometres; Output B: Revenue deflated by price index. Sources: Bureau of Transport and Communications Economics, Transport Indicators; Annual Reports)

| Year | Output A | Output B | Productivity A | Productivity B |
| --- | --- | --- | --- | --- |
| 1981/82 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1984/85 | 105.2 | 133.7 | 100.0 | 127.1 |
| 1987/88 | 137.2 | 209.1 | 82.5 | 125.7 |
| 1992/93 | 235.4 | 200.9 | 133.4 | 113.9 |
| 1995/96 | 323.5 | 228.9 | 155.6 | 110.0 |
| 1998/99 | 331.9 | 189.1 | 175.6 | 97.7 |
| % P.A. 1981/82–1998/99 | | | 3.37 | −0.02 |
| % P.A. 1981/82–1987/88 | | | −3.16 | 4.08 |
| % P.A. 1987/88–1998/99 | | | 7.11 | −2.27 |
| % P.A. 1992/93–1998/99 | | | 4.69 | −2.53 |

[Table options](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142)

Table 3.

Output prices and total price performance 1982–1999 (Output price index A: Revenues/Revenue passenger kilometres;Output price index B: Fare index; Real price index: Price index/Input price index. Sources: Bureau of Transport and Communications Economics, Transport Indicators; Annual Reports)

| Year | Output price index A | Output price index B | Real price A | Real price B |
| --- | --- | --- | --- | --- |
| 1981/82 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1984/85 | 144.9 | 113.5 | 113.7 | 89.1 |
| 1987/88 | 179.2 | 117.2 | 124.4 | 81.3 |
| 1992/93 | 144.4 | 165.5 | 78.9 | 90.4 |
| 1995/96 | 119.7 | 168.9 | 64.1 | 90.5 |
| 1998/99 | 118.0 | 205.9 | 58.9 | 102.7 |

[Table options](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142)

The two series, TFP and real prices need not be mirror images of one another if profitability increases. Output prices deflated by input prices could rise, with constant TFP, if profitability, measured by the ratio of revenue to cost, increased (for an analysis, see [Waters et al., 1998](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#BIB10)). The profitability indices are presented in [Table 4](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL4), using the two price and output series. These should be identical, since they differ only because of the output measures which are cancelled out; differences are due to rounding. They indicate that profitability was high in the mid 1980s; it fell in the late 1980s and was moderate in the early 1990s (this masks a fall in profitability in the initial years of the 1990s). By the mid 1990s, profitability was poor (at least for Ansett), in spite of there being only two airlines competing. It had improved somewhat in the late 1990s.

Table 4.

Profitability indices: 1982–1999 (Index A: using price index A and output index A; Index B: using price index B and output index B; Profitability index: TFP index×Real price index)

| Year | Index A | Index B |
| --- | --- | --- |
| 1981/82 | 100.0 | 100.0 |
| 1984/85 | 113.7 | 113.2 |
| 1987/88 | 102.6 | 102.2 |
| 1992/93 | 105.3 | 103.0 |
| 1995/96 | 99.7 | 99.6 |
| 1998/99 | 103.4 | 100.3 |

[Table options](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142)

By looking at [Table 4](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL4) and [Table 5](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL5), it is possible to determine who enjoyed the gains from improved productivity. It is clear that most of the gains were passed on to the travellers. Even though there have only been two airlines, they have not been able to convert productivity gains into profit. Input prices have risen at approximately the same rate as inflation (see the price index for other materials). However there have been some interesting shifts in input prices. While capital and fuel prices have fallen in real terms, labour prices have risen. Deregulation has not put a squeeze on the airline labour force; to some extent the labour force may be gaining some of the benefits of the productivity increase. It is also possible that there may be some changes in the types of labour employed by the airlines over the period. Low paid clerks may be being replaced by higher paid IT professionals. If this is so, the apparent rise in wages may be exaggerating any movement, and the gain in productivity may also be less than is apparent. This would be so because labour numbers would be understating the labour input in later years if there has been a shift in employment to higher efficiency labour.

Table 5.

Input prices: 1982–1999 (Sources: Annual Reports; Bureau of Transport and Communications Economics, Transport Indicators; Australian National Accounts; Industry Sources)

| Year | Price index | | | | |
| --- | --- | --- | --- | --- | --- |
|  | Capital | Fuel | Labour | Other | Composite |
| 1981/82 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1984/85 | 116.1 | 130.3 | 132.3 | 124.8 | 127.4 |
| 1987/88 | 157.8 | 99.3 | 166.4 | 153.6 | 144.1 |
| 1992/93 | 173.6 | 87.5 | 300.0 | 188.3 | 183.1 |
| 1995/96 | 167.2 | 95.1 | 289.9 | 198.6 | 186.7 |
| 1998/99 | 155.4 | 95.7 | 358.5 | 204.2 | 200.5 |

[Table options](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142)

An international comparison was made by calculating a bilateral productivity comparison with Qantas, which was one of the airlines included by [Oum and Yu (1995)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142" \l "BIB9) in a study of the productivity of international airlines. The same methods were used to calculate productivity differences as were used by Oum and Yu, thus enabling comparability. The Australian domestic airline can then be compared to other airlines in the sample. Oum and Yu present unadjusted TFP measures, and also TFP measures adjusted for a range of factors, such as stage lengths, which affect productivity. The resultant residual TFP is thus a better measure of the efficiency of an airline.

Results are presented in [Table 6](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142#TBL6). Measures are given for the Australian domestic airline and Qantas, and for a number of mainly short haul airlines in other continents, such as SAS and US Air. If the unadjusted TFP measures are taken, the Australian domestic airline's performance looks very poor in comparison. Its performance improves when the residual or adjusted TFP measure is used, as would be expected. However, its productivity performance is still significantly below that of all the other airlines reported here. This suggests that, by the early post deregulation period, the gap in performance which had been identified in the 1970 and 1980s, between Australian domestic airlines and that of US and other airlines, had not been significantly narrowed (indeed, it may have increased during the 1980s, when Australian productivity growth was modest but that of overseas airlines was quite strong).

Table 6.

International productivity comparison: 1993 (Source: Calculations as described in text [Oum and Yu (1995)](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142" \l "BIB9))

| Airline | Gross TFP index | TFP index |
| --- | --- | --- |
| Australian Domestic | 0.462 | 0.641 |
| Qantas | 1.295 | 0.945 |
| US Air | 0.799 | 0.897 |
| Air Canada | 0.850 | 0.971 |
| All Nippon | 0.725 | 0.839 |
| Lufthansa | 1.002 | 1.032 |
| SAS | 0.774 | 0.905 |
| Iberia | 0.828 | 0.907 |

[Table options](http://www.sciencedirect.com.ezproxy.libproxy.db.erau.edu/science/article/pii/S0967070X01000142)

The picture may have changed somewhat since 1993. As has been seen, according to the preferred measure of productivity, TFP growth in the 1990s in Australia has been strong. Since productivity growth in US airlines has eased off in the 1990s, there is likely to have been some catch up. Nevertheless, it is difficult to escape that conclusion that TFP in the Australian domestic airline system remains significantly below that which can be achieved in overseas airline markets.

5. Conclusions: the prospects for future competition

The overall productivity results presented here suggest that deregulation has made a difference, but not as great a difference as was expected. Productivity growth in the 1990s has been good, and real yields and air fares have fallen in the post deregulation period, according to the preferred measure. Most of the productivity gains have been passed on to customers, something which might not have been fully anticipated granted the limited competition in the market. However, it still seems that there is a large productivity difference between the domestic airlines and overseas airlines, such as those in North America.

These results can be seen as a test of the competition versus regulation/ownership debate. Privatisation and the removal of cost plus regulation has meant that the airlines have the maximum incentive to minimise costs, and no constraints on doing so. In spite of this, they seem to be falling well short of achieving the productivity levels which are feasible. The lack of competition has meant that the airlines have not been forced to minimise costs. This lack of pressure is reflected in the airline labour market. Labour productivity is still low compared to that of overseas airlines, and labour remuneration has been increasing significantly in real terms. So competition at the product market level has not yet resulted in strong competition at the labour market level.

There are significant implications for the future competitive structure of the industry. Two entrants, Impulse Airlines and Virgin Blue (part of the Virgin Group) entered the market in mid 2000. The productivity measures presented here suggest that entrants may well be able to achieve much lower costs than the incumbents. This will give them a window of opportunity to establish themselves, and there is the possibility of sustained increased competition. The incumbents will be forced to match the prices of the entrants, and they will only be able to do this in the long term if they are able to reduce their costs. The cost advantage was not sufficient for Impulse to survive; in mid 2001 it was forced to merge with Qantas. However, one of the entrants, Virgin Blue, is part of a larger group with log pockets, and it can be expected to make a long term commitment to the market. Thus the outlook for continued productivity catch up is good.